Exercises Training Program: Its Effect on Muscle Strength and Activity of Daily Living among Elderly People

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ABSTRACT

Context: Aging is associated with the loss of muscle strength and difficulties in functional activities. Research evidence has identified that regular exercises in the elderly have been shown to enhance gait, balance, and muscle strength, leading to a reduction in seniors' dependency.

Aim: This study aimed to evaluate the effect of an exercise training program on muscle strength and activity of daily living among elderly people.

Methods: A quasi-experimental research design used in the current study. A purposive sample of 92 male and female elder adults was distributed in three geriatric homes collected through a period of one year. This study was carried out at three geriatric homes in Minia city (Dar Omar Bn El-Khattab, Dar El- Qedesa Hena, and Dar El- Raee El-Saleh), Egypt. Three tools utilized in collecting the data; Structured Interview Questionnaire; Muscle Strength Scale for upper and lower limbs; Katz and Akpom Scale used to assess activities of daily living.

Results: The current study findings revealed that the level of independence of elderly clients at the end of the program became (87.5%) compared to zero at the first observation. There was a highly statistically significant difference in muscle strength in upper limbs between first and tenth observation as (37.5%) have normal muscle strength compared to none at first observation. Also, a highly statistically significant difference in lower limb strength between the first and tenth observation (58.75%) has normal muscle strength in the lower limb compared to none at first observation.

Conclusions: The study findings concluded that the regular performance of exercises for an extended period enhances the performance of the daily living activity and strengthens body muscles, which improves general health. Recommendations: Active exercise training programs should be recommended by evaluating their effect on the quality of life for the elderly, particularly those at the elderly home.

Keywords: Elderly people, the activity of daily living, exercise training program, muscle strength

1. Introduction

The global population aged 60 years or over numbered 962 million in 2017, more than twice as large as in 1980 when there were 382 million older persons worldwide. The number of older persons is expected to double again by 2050, when it is projected to reach nearly 2.1 billion *(United Nations, 2017).* As individuals age, there is a concomitant decline in voluntary physical activity associated with decreases in maximal aerobic capacity and muscle strength. Muscle strength is a critical component in preserving functional activity in older adults. Consequently, numerous studies have investigated the factors contributing to the loss of strength in elderly persons *(Papa, Dong, & Hassan, 2017).*

Aging is a physiological process where organs and tissue's structure and functional capacity progressively degenerate over time. The aging process is extraordinarily complex and is continuously influenced by numerous factors, such as lifestyle choices, environment, genetics, social network, and chronic diseases *(Strøm & Rasmussen, 2014).*

Healthy aging is characterized by a decrease in bone and muscle mass and an increase in adiposity. A decline in muscle mass and a reduction in muscle strength leads to the risk of fractures, frailty, reduction in the quality of life, and loss of independence. These changes in the musculoskeletal system reflect the aging process and the consequences of reduced physical activity *(Faulkner, Larkin, Claflin, & Brooks, 2007).* Aging causes a change in physical appearance and a decline in function. Measurable changes in shape and body occur. The body's ability to maintain homeostasis becomes increasingly diminished with cellular aging, and organ systems cannot function at full efficiency because of cellular and tissue deficits *(El-Moselhy, 2016).*

In older individuals, decreased muscle strength is highly predictive of functional limitations and disability. Most functional tasks used in normal day-to-day activities are of relatively short duration and, therefore, more strongly related to muscular strength than to muscular endurance. In the last decade, evidence from epidemiological studies has shown that muscle weakness, especially low muscular

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strength, is inversely associated with the risk of falling in older adults *(Pijpers et al., 2012).*

Exercise can enhance physical fitness components such as muscle strength, aerobic endurance, coordination, balance, and flexibility. Improving muscle strength is very important because institutionalized older people often experience weakness, which results in slower walking speed and lower levels of physical activity. There are two different ways to improve muscle strength through exercise. One is by training localized muscle groups. The other is by training to improve functions related to motor activities such as walking, stair climbing, standing up from a chair, rising from a bed, reaching, and bending. These functions are embedded in the daily tasks faced by older institutionalized persons. Exercise programs aimed to improve daily tasks should include functional training items to be as effective as possible *(Weening-Dijksterhuis, 2014).*

Research evidence has identified that regular exercises in the elderly have been shown to enhance gait, balance, and muscle strength, leading to reduced seniors' dependency *(Franco et al., 2015).* Many studies identified that muscle strength training, and stretching exercises are more effective in improving the level of independence among the elderly *(Ishigaki, Ramos, Carvalho, & Lunardi, 2014).*

2. Significance of the study

Egypt is expected to have the most significant number of old (23.7 million) and oldest-old (3.1 million) populations in the region in 2050 *(Sweed, 2016).* The incidence of physical performance limitations among the older population will increase as well. As much as 42% of those over 60 years of age have difficulties in performing activities of daily living (e.g., walking speed or standing up from a chair), 15–30% report being unable to lift or carry 10 pounds (4.5 kg), and >30% are confronted with physical disabilities *(Tieland, Trouwborst, & Clark, 2018).*

Elderly physiological changes lead to loss of physical function and dependence on assistance in performing activities of daily living (ADLs), requiring hospitalization or extended hospital stays and reducing longevity. So, this study was carried out to investigate the effect of exercises on muscle strength and the daily living of older people.

3. Aim of the study

This study aimed to evaluate the effect of an exercise training program on muscle strength and activity of daily living among elderly people.

3.1. Research hypotheses

It was hypothesized that:

- The activities of daily living of study subjects will be improved after the training program compared to the pre-program level.
- The muscle strength of the study subject will be improved after the training program compared to the pre-program level.

4. Subjects and Methods

4.1. Research design

Quasi-Experimental research (pre/post-test) design was utilized in the current study. Quasi-experimental studies have been widely accepted and used in the social sciences for several decades. Quasi-experimental research shares similarities with the traditional experimental design or randomized controlled trial, but it specifically lacks the element of random assignment to treatment or control *(Bärnighausen et al., 2017).*

4.2. Research Setting

The current study was carried out at three geriatric homes in Minia city (Dar Omar Bn El-Khattab (18 clients), Dar El- Qedesa Hena (40 clients), and Dar El-Raee El-Saleh) (22 clients).

4.3. Subjects

A purposive sample of the total number of elderly (92 clients) in three geriatric homes, 12 clients were excluded from total number because they have exclusion criteria that lading to actual study sample (80 elderly clients), male and female collected through one year.

Inclusion criteria

- Patients 60 years and older of both genders.
- Able to do exercises and perform the activity of daily living and balance.

Exclusion criteria

- Clients who cannot read and write.
- Bedridden elderly.
- Severely limiting arthritis.
- Severe psychiatric diseases.
- The elderly have any health disorders that are contraindicated for performing the exercise.
- The elderly have health disorders that affect balance and movement**.**

4.4. Tools of data collection

Three tools were used to collect data in this study.

4.4.1. Structured Interview Questionnaire

It was developed by the investigator to assess clients' demographics, health history, and knowledge. It consisted of three main parts. The first part is concerned with the demographic data as age, gender, level of education, and phone number. The second part included assessing health history data included a medical history regarding the presence of chronic diseases and medication used. The first and second parts are distributed once at the beginning of the study.

The third part is a knowledge questionnaire form designed to assess the client's knowledge about exercises. It covered knowledge related to benefit, importance, precautions, and exercise types *(Tieland, Trouwborst, & Clark, 2018; Miguel, 2014).*

Scoring system

Each item was observed, categorized, and scored into either correct = one or incorrect = 0 on all questions. These scores are further classified as unsatisfactory level (less than 60%) and satisfactory level (if equal or more than 60%).

4.4.2. Katz and Akpom Scale

This scale was adopted from *Katz and Akpom (1976)*. It is used to assess basic activities of daily living. The scale included six main activities of daily living. Those are bathing, dressing, feeding, transfers, continence, and ambulation. The six different functions are measured and scored according to the individuals' actual performance of these functions. This scale was applied before starting the application of the exercises, and after that was applied six times, once per month, and then was applied three times, once every two months.

They are categorized into three levels of dependency. Each item scored from one to three. One indicates full independence, i.e., "ability to perform the task without human assistance." Two indicates that the elder needs assistance, i.e., "ability to perform the task with some help," and three indicates total dependence, i.e., "inability to perform the task even with assistance." The total score of the scale is 6-18 points. According to Katz and Akpom scale, the elderly are classified into three categories. Independence (those with a score of 6 points), partially dependent (score 7 to 12 points), and totally dependent (those who scored 13 to 18).

4.4.3. Muscle Strength Scale for (Upper& Lower) Limbs

This scale was adopted from *Hahn et al. (1996)* to assess muscle strength of upper and lower limbs. This scale used pre and post-performing exercises.

The scoring system ranged from 0-5 scores. Complete paralysis for the patient has scored (0). Only a trace or flicker of movement is seen or felt, or fasciculations observed have scored (1). Muscle can only move if the resistance of gravity is removed, take score (2). Strength further reduced such that joint can be moved only against gravity with examiner's resistance completely removed have scored (3), strength reduced. However, contraction can still move joint against resistance have scored (4), while a score of (5) has given for patient who has normal strength.

4.5. Procedures

Content validity was made to identify the degree to which the used tools measure what was supposed to be measured. A panel of five experts examined the developed tools in the field of the study (Medical-Surgical Nursing Department, Faculty of Nursing, Minia University). All jury members (100%) agreed that current study tools were valid and relevant to the aim of the study.

Reliability was ascertained statistically by using the Alpha Chronbach test to ensure that the study tools are reliable. The reliability of the structured interview questionnaire, Katz and Akpom scale, Muscle Strength Scale for upper limbs, and Muscle Strength Scale for lower limbs were (0.95, 0.87, 0.71 & 0.73), respectively.

A pilot study was carried out on 10% (n = 8) of the total sample to test the clarity of tools, estimate the time required for fulfilling it, and test the study process's feasibility. Based on the pilot study results, no modifications or refinements were done, and the subjects were included in the actual sample.

Formal permission had been obtained from the Ethical Committee in the Faculty of Nursing, Minia University, Nursing homes. Agreement from Egypt Academy for Research Center and Technology to carry out this study. The subject's participation in this study was voluntary, and each involved subject was informed about the purpose, procedure, benefits, and nature of the study, and that he/she had the right to withdraw from the study at any time without any rationale, then written consents were obtained. Confidentiality and anonymity of each subject are ensured through coding of all data and protecting the obtained data.

The current study was conducted by preparing different data collection tools and obtaining a formal paper agreement, which was taken in one week before conducting the current study**.** The study was conducted over one year, starting from August 2017 to August 2018. The researcher conducts the first visit to the elderly clients and explains (to clients and caregivers) the specific objectives of the program that are the benefits and importance of exercises, the different types of exercises, and the precautions that should be observed during performing exercises.

The researcher fills the Structured Interview Questionnaire (Tool I) before starting the exercise program and the only third part (Knowledge Questionnaire form) of the tool I applied before and once after starting the intervention. Other scales (Muscle Strength Scale and Katz &Akpom scale) applied before starting the application of the exercise, and after that applied six times, once per month, and after six months from the starting program applied three times every two months. The clients were evaluated for one year.

The researcher trained each client (individualized sessions) the different exercises two times weekly and trained the caregiver to perform the exercise with the elderly clients. (2 different days for each geriatric home, for example, Sat. & Tues. In Dar El-Qedesa Hena, Sun. & Wed. in Dar Omar Bn-El-Khattab, Mon. & Thurs. in Dar El-Raee Elsaleh). The clients demonstrated and re-demonstrated the exercises in front of the researcher to ensure proper performance. The duration of each exercise had taken about 30-45 minutes and according to each client's ability. The researcher stopped the exercise when the occurrence of pain, discomfort in the chest, neck, jaw, arms, dizziness, or syncope, ask the researcher to stop the exercises, palpitations, or tachycardia.

Muscle strengthening exercises include: (1) Sit to stand exercise for five repetitions. (2) Mini squats exercise repeats five times. (3) Calf raises exercises to repeat five times. (4) Sideways leg lift exercise repeats five times. (5)

Leg extension exercises repeat five times. (6) Wall press-up exercise from 5–10 repetitions. (7) Bicep curls exercise repeat five times. The duration of the exercise took about 30-45 minutes and according to each client's ability. The session plan is designed according to the physical ability and attention span of the elderly.

The client performs (muscle strength exercises) two times weekly for 12 months with supervision from a health caregiver. The researcher follows the clients once weekly to evaluate the clients' performance of the exercise. The researcher designed a booklet in the Arabic language and is validated by a jury of five experts of nursing specialists, including exercise, to strengthen the muscles. It was given to each elderly to guide and enrich his/her memory about activities performed in each session. The researcher instructs the exercise to the elderly and caregivers in geriatric homes.

4.7. Data analysis

Data summarized, tabulated, and presented using descriptive statistics in the form of frequency distribution, percentages, means, and the standard deviations as a measure of dispersion. A statistical package for the social science (SPSS) version (20) was used to analyze the data. Numerical data expressed as mean & SD. Qualitative data expressed as frequency and percentage. Probability (P-value) is the degree of significance; less than 0.05 was considered significant. The smaller the P-value obtained, the more significant is the result of less than 0.001 considered highly significant, and the correlation coefficient was done by using the Pearson correlation test.

5. Results

Table 1 reveals the distribution of the studied clients according to the demographic data. The table shows that 87.5% of the study group between 60->75 years. Regarding gender, it was found that 61.25% were males. In relation to education levels, it was found that 46.25% of the study group had primary education, while 20% of the study sample have a Bachelor's degree.

Table 2 shows that 57.5% of the study group had no chronic illness, while 27.5% had hypertension, and 12.5% had hypertension and Diabetes; 60% of the study group had not used any medication.

Table 3 shows highly statistically significant differences regarding the satisfaction of elderly knowledge before and after the intervention.

Table 4 shows highly statistically significant ($P \leq 0.01$) between 1st and 10th observation that the value of partial dependence in 1st observation was 62.5% while in 10th observation was 12.5%, and the ratio of independent client became 87.5%, in 10th observation compare to (0) in the first observation.

Figure 1 shows improvement in the elderly level of independence that mean±SD improved from 11.8 & 1.55 in the first observation to 6.3 & 0.75 in the last observation.

Table 5 shows a highly statistically significant ($p \leq 0.01$) between first and last observation in muscle strength of the upper limb. It reveals normal strength of upper limb muscles was 0% in the first observation but improved in the last observation to 37.5%. The table also shows a t-test value of 20.6 and a p-value of 0.000.

Figure 2 shows improvement in upper limb muscle strength that mean±SD improved from 2.6 & 0.47 in the first observation to 4.3 & 0.48 in the last observation.

Table 6 shows that highly statistically significant ($p \leq 0.01$) in the difference between first and last observation in Muscle Strength scale (lower limb), that show improvement of normal muscle strength from 0% in first observation to 58.75% in last observation, and also show (t) value of (27.4).

Figure 3 illustrates the improvement in lower limb muscle strength that mean±SD improved from 2.6 & 0.47 in the first observation to 4.5 & 0.49 in the last observation.

Table 7 reveals that there were no correlation and no significance founded between Katz Scale Score and Muscle Strength Scale (Upper & Lower) Limbs in the first interview, the correlation from 3rd month that show positive correlation in (upper & lower) limbs presented by r value (r= 0.261& 0.261) & Statistical significance documented by p value (p = 0.029 & 0.029), and in 6th month that show positive correlation documented by (r=0.521& 0.352) & (p= 0.000 & 0.003), and in the last visit showed that highly positive correlation between Katz scale and Muscle Strength scale in (upper & lower) limbs documented by (r= 0.695 & 0.459) and show highly Statistical Significant in upper & Lower limb that documented by (p value= 0.003& 0.000).

Table (1): Frequency and percentage distribution of the studied elderly according to their demographic characteristics (80).

Demographic Data	Study (n=80)	
	N	%
Age / years		
60->75	70	87.5
75->85	8	10
≤85	2	2.5
Mean ± SD	67.3±6.4	
Gender		
Male	49	61.25
Female	31	38.75
Level of Education		
Basic	37	46.25
Secondary	27	33.75
Faculty	16	20

Table (2): Frequency and percentage distribution of the studied elderly according to their medical history (80).

Medical Data	Study (n=80)	
	N	%
Presence of Chronic Illness		
None	46	57.5
Hypertension	22	27.5
Arthritis	2	2.5
Hypertension & Diabetes	10	12.5
Medication Used		
None	48	60
Anti-Hypertensive Medications	22	27.5
Anti-Hypertensive & Diabetic medication	10	12.5

Table (3): Distribution of study group regarding total satisfactory knowledge about exercises before and after the intervention (n = 80).

Knowledge Score	Before		After		χ^2	p-value
	N	%	N	%		
Satisfactory	0	0	68	85		
Unsatisfactory	80	100	12	15	0.803	0.000

Table (4): Distribution of study group regarding their level of independence in ADL before and after the intervention (n = 80).

Katz Index Score		Study (n=80)		Paired t-test	P-value
		N	%		
1st observation	Independent	0	0	24.3	0.000
	Partial Dependent	50	62.5		
	Complete Dependent	30	37.5		
10th observation	Independent	70	87.5		
	Partial Dependent	10	12.5		
	Complete Dependent	0	0		

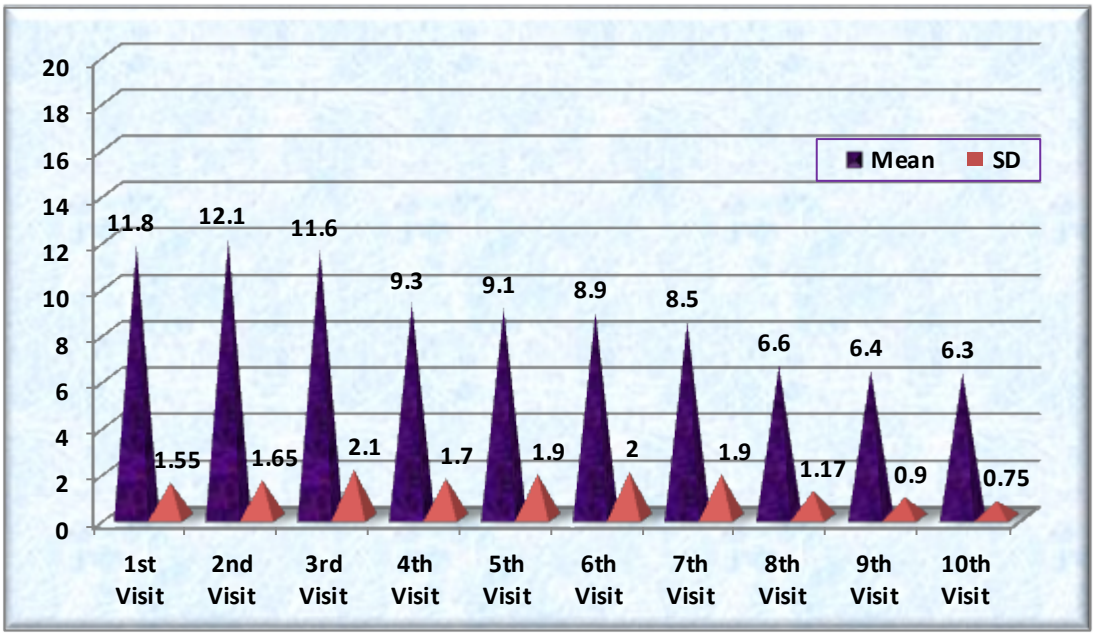

Figure (1): Distribution of mean and SD throughout the ten observations for the study sample regarding the Katz Index of Independence in ADL (n = 80).

Table (5): Frequency and percentage distribution of the studied elderly according to their upper limb muscle strength (no. 80).

Muscle Strength Scale (Upper Limb)		Study (n = 80)		t-test	P-value
		N	%		
1st observation	Normal strength	0	0	20.6	0.000
	The active movement against gravity &	0	0		
	Weak contraction against gravity	54	67.5		
	Active movement with gravity eliminated	26	32.5		
	Minimal contraction	0	0		
	No movement	0	0		
10th observation	Normal strength	30	37.5		
	The active movement against gravity &	50	62.5		
	Weak contraction against gravity	0	0		
	Active movement with gravity eliminated	0	0		
	Minimal contraction	0	0		
	No movement	0	0		

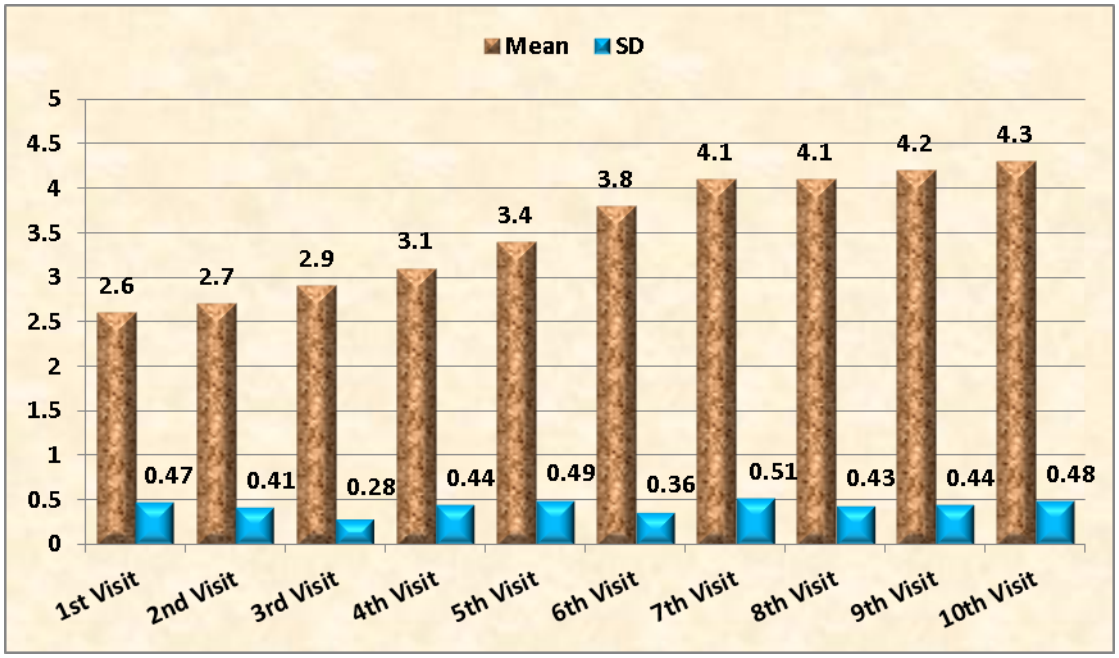

Figure (2): Distribution of mean & SD throughout the ten observations for the study sample regarding upper limb muscle Strength (n = 80).

Table (6): Frequency and percentage distribution of the study sample regarding their lower limb muscle strength before and after the intervention (n = 80).

Muscle Strength Scale (Lower Limb)		Study (n = 80)		t-test	P-value
		N	%		
1st observation	Normal strength	0	0	27.4	0.000
	The active movement against gravity &	0	0		
	Weak contraction against gravity	54	67.5		
	Active movement with gravity eliminated	26	32.5		
	Minimal contraction	0	0		
	No movement	0	0		
10th observation	Normal strength	47	58.75		
	The active movement against gravity &	33	41.25		
	Weak contraction against gravity	0	0		
	Active movement with gravity eliminated	0	0		
	Minimal contraction	0	0		
	No movement	0	0		

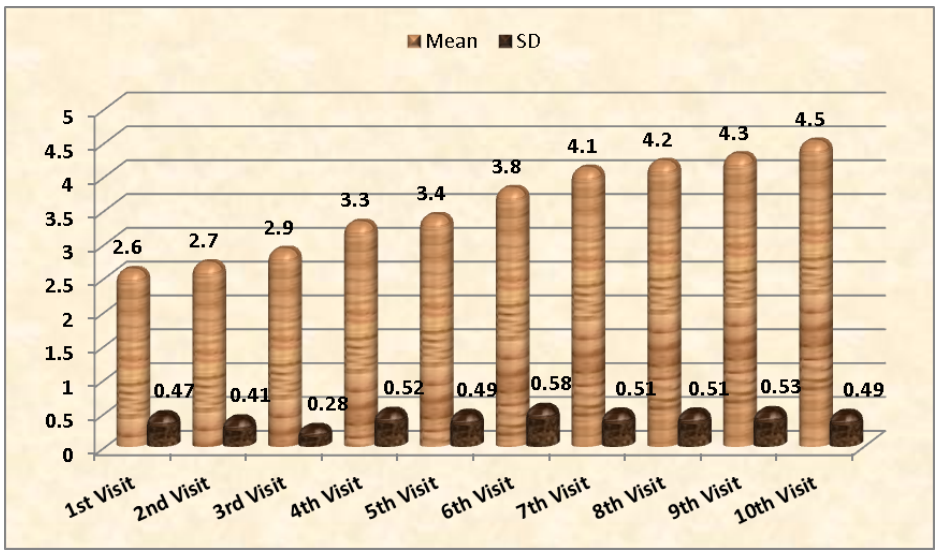

Figure (3): Distribution of mean & SD throughout the ten observations for study sample regarding lower limb muscle strength (n = 80).

Table (7): Correlation between Katz Scale score and muscle strength scale (upper & lower) limbs.

Katz Scale Score	Muscle Strength Upper Limb		Muscle Strength Lower Limb	
	r	*p*	*r*	*p*
1st Interview before the program	0.119	0.325	0.119	0.325
1st month after starting program	0.084	0.491	0.084	0.491
2nd month	0.261	0.029	0.261	0.029
3rd month	0.667	0.000	0.486	0.000
4th month	0.415	0.000	0.261	0.029
5th month	0.521	0.000	0.352	0.003
6th month	0.421	0.000	0.421	0.000
8th month	0.579	0.001	0521	0.000
10th month	0.542	0.004	0.426	0.000
12th month and last visit	0.695	0.003	0.459	0.000

6. Discussion

In old age, independent and safe mobility is essential for maintaining one's quality of life and independence. Especially reductions in muscle strength and poor balance may lead to mobility limitations and further disability. The loss in muscle strength may be attributed to the aging process *(Groessl et al., 2019).*

Strengthening exercises provide appropriate resistance to the muscles to increase endurance and strength. A well-balanced exercise program can improve general health, build endurance, and slow many of the effects of aging. The benefits of exercise improve not only physical health but also enhance emotional well-being. Regular physical activity remains an essential behavior for endorsing health, Postponing or preventing predominant musculoskeletal disorders such as mechanical low back pain, neck, and shoulder pain *(Elmagd, 2016).*

Based on the result of the current study, it has been noticed that the mean±SD of age was 67.3±6.4 years with age group ranged from 60-≤85 years old. The present study's findings were compatible with *El-Gilany, Hatata, Soliman, and Refaat (2013)*. They reported in a study titled "prevention of recurrent falls in elderly: a pre-post intervention study in a rural community, Egypt," that most of the study group with the mean age of 69.6±6.2 years. The study also agreed with *Ubolwan (2013),* who carried out a study about "an exploration of the relationships among demographics, risk factors, perceived self-efficacy, and fall prevention behaviors in community-dwelling Thai older adults," and reported that the study sample ranged in age from 60-79 years old.

The present study illustrated that more than half of the study group were males because most of the residents in geriatric homes were males because of their needs to care and attention more than females, especially after the death of their wives. This result is in the same line with a study

done by *Kalu, Vlachantoni, and Norman (2019)*. They conducted a study entitled "knowledge about risk factors for falls and practice about fall prevention in older adults among physiotherapists in Nigeria." They reported that most of the study group were males. Also, the current study disagreed with *Bilik, Damar, and Karayurt (2017),* who found that more than two-thirds of the studied clients were females.

Concerning educational levels, it was found that about half of the study group had basic education. This finding may be rationalized as in the past; there was no interest in high education, which leads to a lack of health awareness about fitness and exercises among older people. This finding agrees with *Bilik et al. (2017)*, who stated that about less than half of the study group had primary education and supported by *Ubolwan (2013),* who reported that most participants' educational level was primary education.

In the present study, it has been noticed that there were highly statistically significant differences between the satisfactory knowledge of the elderly pre-and post-intervention that may be due to the improvement of elderly knowledge about exercises after the intervention. These results were *following Maneeprom, Taneepanichskul, Panza, and Suputtitada (2019)*, who said a general improvement of elderly knowledge about exercises immediately after the intervention.

Concerning the activity of daily living (ADL), in the current study, it has been noticed that there was a highly statistically significant improvement in the activity of daily living, and the percent of dependent elderly decreased significantly after interventions. In the last observation, it was noticed that most of the study group became independent compare to none before the intervention. That may be due to the strength of the elderly muscles resulting from the perseverance exercises training program that reflects on the ability of the elderly to perform ADL.

These results agreed with *Abbasian et al. (2016),* whose study about "status of daily living activities among older people in Maku," they mentioned that the minority was dependent, and the majority was independent in their daily living activities after the exercises training program. The current study finding was in the same line with *Vasconcelos Souza dos Santos, Carneiro Vasconcelos, and Alves dos Santos, (2016)*. They conduct a study about "strength and ability to implement the activities of daily living in elderly residents in rural areas" and reported that the evaluation of ADL showed that most of the elderly could perform their tasks independently after interventions.

Also, this result was validated by *Yamazaki, Hayashida, and Yontz (2017),* who found highly statistically significant differences in the improvement of activity of daily living after the exercise training program. These findings support the first research hypothesis of improving the activity of daily living and increase the level of independence among older people.

Regarding muscle strength of upper and lower limbs, the present study revealed a highly statistically significant improvement in the strength of (upper and lower) limbs, that at the end of the exercises program, there was an improvement in the percentage of elderly with normal muscle strength in upper and lower limbs. That reflects the effect of performing exercises, especially (muscle strength exercises) on strengthening whole body muscles.

These results agreed with *Tiedmann, Sherrington, Close, and Lord (2013)*, who identified that muscle strengthening and balance training and stretching exercises effectively prevent falls and found a significant improvement in the balance, strengthening, and stretching exercises after exercise intervention.

Another study reported by *de Labra, Guimaraes-Pinheiro, Maseda, Lorenzo, and Millán-Calenti (2015)* about the "effects of physical exercise interventions in frail older adults: a systematic review of randomized controlled trials," and found highly statistically significant improvements in mobility and strength after the intervention of exercise program. Also, *Tecchio and Gessinger (2017)* study about "upper and lower limb functionality and body mass index in physically active older adults." They mentioned that regular physical exercise helps preserve motor function and maintain muscle and bone mass and functionality in older adults.

This result agreed with *Joshua et al. (2014),* who showed a highly statistically significant improvement of lower-extremity physical function after the exercise training program. They also reported that higher physical activity levels are associated with greater muscle strength. Having in mind that muscle strength is associated with a lower risk of disability and better health.

This finding is also supported by *Sharif, Al-Harbi, Al-Shihabi, Al-Daour, and Sharif (2018),* who reported that (lower limb) the ankle plantar flexor and knee extensor strengths of older adults improved after the performance of exercises training program. They added that as people age, the risk of falls increases because a decrease in muscle mass leads to atrophy.

Further support *by Li et al. (2016)*. They mentioned in their study about "exercise and fall prevention: narrowing the research-to-practice gap and enhancing the integration of clinical and community practice" that many patients and physicians believe strength training occurs in a health club or gymnasium-based program. However, this need not be the case. The exercise training program consists of moving the major joints repeatedly through the full range of motion several times weekly, with or without some form of resistance can be initiated using only gravity as resistance. An advantage of an exercise training program is that exercise can efficiently be completed at home, and these exercises can improve seniors' muscle strength of upper and lower limbs. These findings are supporting the current research hypothesis of strengthening the elderly muscles of upper and lower limbs.

Finally, regarding the correlation between ADL and muscle strength, the current study data represented a highly positive correlation between ADL and muscle strength in (upper & lower) limbs. This finding may be due to strengthening muscles of upper and lower limbs by strength exercises program leads to improve the ability of older

people to perform ADLs effectively and being a more independent person.

This result was inconsistent with *Buckinx et al. (2015)*, who found that lower limb muscle strength was positively associated with enhanced motor skills and the ability to perform daily activity. Muscle strength is a potentially important determinant of mobility in older people.

Indeed, several studies supported the association between low muscle strength and a decrease in physical mobility. The present study agreed with *Langhammer, Bergland, and Rydwik (2018)*. The study was about "the importance of physical activity exercise among older people." They reported that strength training exercises had been shown to increase lean body mass, improve physical performance, and, to a lesser extent, positively affect self-reported activities of daily living, maintaining the quality of life, health, and physical function.

Another study reported by *Neves et al. (2018)* about "correlation between muscle mass, nutritional status and physical performance of elderly people" and found a relationship between the decline in strength and muscle mass of lower and upper limbs, with the decline of mobility in the activity of daily living. Also, they identified that hand strength correlates with upper extremity strength and general body strength that reflect on general quality of life. These findings support the current research hypotheses to improve muscle strength and increase the activity of daily living performance lading to increase the level of independence among the elderly.

7. Conclusion

The study findings concluded that the elderly exercise program in the form of muscle-strengthening exercises induced a significant improvement in reducing the level of dependency in performing the activity of daily living among elderly people through strength upper and lower extremity. Finally, the present study has demonstrated that regular performing exercises for a long period enhance the performing of daily living activities and strengthens body muscles, which improve general health, which supports the research hypothesis.

8. Recommendations

- Active exercise training programs should be recommended and evaluated for their effect on the quality of life for the elderly, particularly those at the elderly home.
- Designing teaching and training programs for the old age group and health caregivers about strength muscle exercises to increase independence and improve their quality of life.

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